

What Is Claimed Is:

1. A method of manufacturing a copper interconnects on a semiconductor wafer comprising:

polishing a copper interconnect layer to form said copper interconnects, said polishing step including the use of a slurry that contains BTA;

cleaning said semiconductor wafer;

exposing said semiconductor wafer to a H-S-R solution to form a S-R layer over said copper interconnects; and

depositing a layer of dielectric material over said semiconductor wafer after removing said S-R layer with an in-situ plasma pretreatment of said semiconductor wafer with a hydrogen containing plasma.

2. The method of Claim 1 wherein said cleaning step and said exposing step are performed in-situ.

3. The method of Claim 1 wherein said hydrogen containing plasma is NH_3 .

4. The method of Claim 1 wherein said exposing step comprises dipping said semiconductor wafer in said H-S-R solution.

5. The method of Claim 1 wherein said exposing step comprises spraying said semiconductor wafer with said H-S-R solution.

6. The method of Claim 1 wherein said S-R layer is a monolayer.

7. The method of Claim 1 wherein $R = C_nH_{2n+1}$.

8. The method of Claim 7 wherein $n = 16$.

9. The method of Claim 7 wherein $12 < n < 25$.

10. The method of Claim 1 wherein said slurry also contains an H-S-R solution.

11. A method of manufacturing copper interconnects on a semiconductor wafer comprising:

forming a S-R layer over said copper interconnects by polishing a copper interconnect layer with a slurry that includes H-S-R;

cleaning said semiconductor wafer;

exposing said semiconductor wafer to a H-S-R solution; and

depositing a layer of dielectric material over said semiconductor wafer after removing said S-R layer with an in-situ plasma pretreatment of said semiconductor wafer with a hydrogen containing plasma.

12. The method of Claim 11 wherein said hydrogen containing plasma is NH_3 .

13. The method of Claim 11 wherein said forming step, said cleaning step, and said exposing step are performed in-situ.

14. The method of Claim 11 wherein said cleaning step and said exposing step are performed in-situ.

15. The method of Claim 11 wherein said exposing step comprises dipping said semiconductor wafer in said H-S-R solution.

16. The method of Claim 11 wherein said exposing step comprises spraying said semiconductor wafer with said H-S-R solution.

17. The method of Claim 11 wherein $R = C_nH_{2n+1}$.

18. The method of Claim 17 wherein $n = 16$.

19. The method of Claim 17 wherein $12 < n < 25$.

20. The method of Claim 11 wherein said S-R layer is a monolayer.

21. A method of manufacturing copper interconnects on a semiconductor wafer comprising:

forming said copper interconnects by polishing a copper interconnect layer with a slurry that includes H-S-R, said polishing step also forming a S-R layer over said copper interconnects;

cleaning said semiconductor wafer; and

depositing a layer of dielectric material over said semiconductor wafer after removing said S-R layer with an in-situ plasma pretreatment of said semiconductor wafer with a hydrogen containing plasma.

22. The method of Claim 21 wherein said slurry further includes BTA.

23. The method of Claim 21 wherein said hydrogen containing plasma is NH_3 .

24. The method of Claim 21 wherein said forming step and said cleaning step are performed in-situ.

25. The method of Claim 21 wherein $\text{R} = \text{C}_n\text{H}_{2n+1}$.

26. The method of Claim 25 wherein $n = 16$.

27. The method of Claim 25 wherein $12 < n < 25$.

28. The method of Claim 25 wherein R is an organic ligand with a carbon length ≥ 16 .

29. The method of Claim 21 wherein said S-R layer is a monolayer.

30. A method of manufacturing a copper interconnects on a semiconductor wafer comprising:

forming said copper interconnects by polishing a copper interconnect layer with a slurry that includes $\text{HSC}_{16}\text{H}_{33}$, said polishing step also forming a S-R monolayer over said copper interconnects;

cleaning said semiconductor wafer;

dipping said semiconductor wafer in a solution containing $\text{HSC}_{16}\text{H}_{33}$, said dipping step performed in-situ with said cleaning step; and

depositing a layer of dielectric material over said semiconductor wafer after removing said S-R monolayer with an in-situ plasma pretreatment of said semiconductor wafer with a NH_3 plasma.